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10/092,407	03/06/2002	Sumio Morioka	JP920010023US1	9936

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EXAMINER	
TABONE JR, JOHN J	

ART UNIT	PAPER NUMBER
2138	

DATE MAILED: 04/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/092,407	MORIOKA ET AL.	
	Examiner	Art Unit	
	John J. Tabone, Jr.	2138	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *01132006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-23 are pending in the present application. And have been examined. Claims 1, 5, 9 and 13 are amended, and claims 21-23 are added.

2. Please note that claim 3 was mistakenly listed as the rejected claim in the 35 USC § 101 and 112, 1st paragraph rejections. This should have been independent claim 5 and has now been corrected in this office action.

3. The Examiner has withdrawn the 35 USC § 112, 2nd paragraph rejections as a result of Applicants' amendment filed 01/13/2006.

Response to Arguments

4. Applicant's arguments filed 01/13/2006 have been fully considered but they are not persuasive.

5. <u>As per the arguments concerning the 35 USC § 101 rejections of independent claims 1, 5, 9, and 13:</u>

In response to the argument stating that the claims have no application in the technological art the Examiner withdraws this portion of the rejection. However the Applicants' arguments are not persuasive concerning the first argument of the claims pertaining to a program and the final argument that the claims "do not produce a useful concrete and tangible result". The Applicants' argue on page 9, first paragraph state, "It is respectfully submitted that in error correction field determining whether an error-

containing signal is correctable or not is a fundamental step in an error correcting process". In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., *an error-containing signal is correctable or not*) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The claims only "determine whether the number of errors equals the maximum number of correctable errors". No correction of the errors is claimed.

In reference to the 35 USC § 101 rejection of claim 5 the Applicants' argue, "claim 5 recites a system for processing a digital signal without restricting its implementation [to] computer software. While the specification may provide examples of implementations of the claim in software, nothing in claim 5 restricts its implementation to software". The Applicants' also requests that legal authority supporting the Office Action's position be provided. The Applicants are reminded that during patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). See MPEP § 2111. Also MPEP 2106 clear states, [w]here means plus function language is used to define the characteristics of a machine or manufacture invention, claim limitations must be interpreted to read on only the structures or materials disclosed in the specification and "equivalents thereof." (Two en banc decisions of the Federal Circuit have made clear that the Office is to interpret means

plus function language according to 35 U.S.C. 112, sixth paragraph. In the first, *In re Donaldson*, 16 F.3d 1189, 1193, 29 USPQ2d 1845, 1848 (Fed. Cir. 1994). Thus, at the outset, Office personnel must attempt to correlate claimed means to elements set forth in the written description. The written description includes the original specification and the drawings. Office personnel are to give the claimed means plus function limitations their broadest reasonable interpretation consistent with all corresponding structures or materials described in the specification and their equivalents including the manner in which the claimed functions are performed. See Kemco Sales, Inc. v. Control Papers Company, Inc., 208 F.3d 1352, 54 USPQ2d 1308 (Fed. Cir. 2000). Further guidance in interpreting the scope of equivalents is provided in MPEP § 2181 through § 2186. In light of the above cited rules for examining means plus function claims the Examiner would like to point out that Applicants' own specification on pg. 67, ll. 15-22 states, "the algorithm of the invention can be mounted as <u>firmware</u> (i.e. software instructions stored in a read-only memory) for the error correction device, or may be provided as <u>a computer-readable program</u> that is recorded on a storage medium, such as a floppy disk, a hard disk, an optical disk or a magneto-optical disk. The program of the invention may be written in an arbitrary object-oriented language or a programming language such as C, and stored on the above mentioned storage medium." Also, pg. 1, ll. 10-18 states the algorithm is implemented in a program. The Examiner asserts, in citing claim 5 for example, that this means each of the recited "unit" limitations are reasonably interpreted as software routines, and each of the recited "means" are reasonably interpreted as software routines. Therefore, the system of claim 5 can be reasonably

interpreted as a system of software, per se, which is functional descriptive material, per se, and is non-statutory. Until functional descriptive material is claimed in combination with appropriate hardware to enable it to be employed as a computer component, it functionality cannot be realized.

Further, in claims 1, 5, 9, and 13 the preamble purports it to be a signal processing method, yet none of the recited steps require processing of a signal. While the final step determines whether the calculated number of errors equals the maximum number of correctable errors in the signal, this is still just a computation and not processing of the signal. From a 101 standpoint, what is recited in claims 1, 5, 9, and 13 is purely an abstract idea, manipulation of mathematical algorithms, rather than a practical application of the algorithm. The result of the claim as a whole is a determination, which is nothing more than a thought or computation within a processor. What is determined is not used for processing a signal nor is it at least made available for use in processing a signal. Because of this, the claim fails to produce a tangible result.

Therefore, because of the above reasons, the rejections under 35 USC § 101 for claims 1-20 are maintained.

6. <u>As per the arguments concerning the 35 USC § 112, 1st paragraph rejections of independent claims 1, 5, 9, and 13:</u>

On page 10 of arguments Applicants' cite areas of the specification that provides enablement of the limitation ""obtaining the solution of [said] Yule-Walker equation

without conditional branching". However, in reviewing the cited pages and lines of the specification the Examiner can only find one reference to said limitation on pg. 46, ll. 22-26 which states: "...In order to implement the Yule-Walker equation by a combinational circuit, an algorithm that has no conditional branching must be found, and this is an essential object for the algorithm of the invention". No other reference to said "without conditional branching" can be found throughout the entire specification. For this reason the rejection is maintained, albeit now redirected to claims 5 and 21-23. A new rejection for claims 21-23 follows.

7. As per arguments for independent claims 1, 9 and 13:

With respect to the claim limitation **applied to Reed-Solomon codes having an arbitrary minimum distance** the Applicant's states use of the Koga algorithm is limited since the algorithm can be applied to non-binary BCH codes over GF(2m) and is applicable only to even minimum distance codes. It is not clear to the Examiner what the Applicant is trying to do here since it is know in the art that the minimum distance is fixed in a particular Reed-Solomon code. Therefore, the Examiner interprets that the Yule-Walker equation can be applied to any Reed-Solomon code. In addition, the Examiner respectfully disagrees with the Applicant's assessment of Koga and asserts that there is no mention of such a limitation in Koga. In fact, Koga teaches the invention provides an error correction equipment with simple circuitry that can decode any received code word with reduced quantity of calculation. (Col. 14, ll. 15-17). Further, the Applicants' argue on page 12, "The technique of the present invention has

no such limitation since it does not need 2t+1 th syndrome S_2 thanks to the use of Jacobi's formula, even when the minimum distance is odd. In addition, this makes the gresent invention advantageous over Koga in the number of necessary multipliers". In response to Applicants' argument, it is noted that the purported advantage is not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

8. As per arguments for claims 5, and 21-23:

With respect to the claim limitation "obtaining the solution of said Yule-Walker equation without conditional branching..." the Applicants discloses how the Levinson method, Berlekamp-Massey method and the Euclidean method include conditional branches to obtain Yule-Walker solutions and then refers to Applicant's own disclosure on page 46, lines 1-4 and 7-14. As previously pointed out by the Examiner the prior art of record is silent on conditional branching, which would lead one skilled in the art that conditional branching or no conditional branching would be an option to one skilled in the art. Although the Applicants' has presented their case through "reasoned analysis that the algorithms of Levinson, Berlekamp-Massey and Euclidean require conditional branching the Examiner respectfully disagrees. As a teaching reference, the Examiner refers the Applicants to Berlekamp (US-4162480) col. 27, ll. 43-57, where Berlekamp suggests the use of unconditional branches (without conditional branching) as well as conditional branches. Also, in col. 69, ll. 45-56 Berlekamp suggests decoders are

generated without any branching overhead costs. Please note, for clarity these points have been added to the rejection of claim 5, but by no means changes the ground of rejection.

9. As per arguments for claims 17-20:

Applicants' arguments concerning the limitation "obtaining the solution of said Yule-Walker (YM) equation is limited to addition and multiplication operations" are not persuasive and, as such, the Examiner maintains the rejection of these claims.

10. It is the Examiner's conclusion that independent claims 1, 5, 9 and 13 are not patentably distinct or non-obvious over the prior arts of record namely, Ohira et al. (US-20010053225) in view of Zhang et al. (On the Methods for Solving Yule-Walker Equations and further in view of Koga (US-4694455). Therefore, the rejection is maintained. Based on their dependency on claims 1, 5, 9 and 13, claims 2-4, 17 and 21, 6-8 and 18, 10-12, 19 and 22 and 14-16, 20 and 23 respectively, stand rejected.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

11. Claims 1-23 are rejected according 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

<u>As per claims 1, 5, 9, and 13:</u>

These claims pertain to a program per se and are non-statutory since said program is not embodied in a tangible computer-readable medium. Also, these claims pertain to a mathematical algorithm and manipulation of an abstract idea with no application of the mathematical algorithm to the technological art. These claims further do not produce a useful concrete and tangible result. See *State Street* 149 F.3d 1373. In particular, the final determining step of "whether said number of errors equals the maximum number of correctable errors" has no immediate real-world value to one of ordinary skill in the art as it relates to the disclosed practical application of these methods steps and, therefore fails to provide a useful result. It is too preliminary to be a useful, concrete and tangible result, and it would need to be stored, utilized or otherwise further processed to be of any use.

In addition, claim 5 points to units and means for performing functions. However, as disclosed in the specification of the instant application on page 67, lines 24-28, the units and "means" could be implemented as all software and, therefore, would lack the necessary hardware to enable a useful, concrete and tangible result to be realized.

<u>Claim 2-4, 6-8, 10-12 and 14-23:</u>

These claims are also rejected because they depend on claims 1, 5, 9, and 13 and have the same problems of being directed to non-statutory subject matter.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claims 1-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

<u>Claims 1, 5, 9, and 13:</u>

These claims recite the limitation "obtaining the solution of said Yule-Walker equation <u>without conditional branching</u>..." which is not enabled by the specification. The specification does not explicitly direct the Examiner to the solution of the invention where "no conditional branching" is employed.

<u>Claim 2-4, 6-8, 10-12 and 14-23:</u>

These claims are also rejected because they depend on claims 1, 5, 9, and 13 and have the same problems of failing to comply with the enablement requirement.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohira et al. (US- 20010053225), hereinafter Ohira, in view of Zhang et al. (On the Methods for Solving Yule-Walker Equations), hereinafter Zhang, and further in view of Koga (US-4694455), hereinafter Koga.

<u>Claims 1, 9 and 13:</u>

Ohira discloses an invention which relates to a method for encoding/decoding an error correcting code, a transmitting apparatus and a network which are suitable for use in optical communication networks. Ohira teaches an encoding side (encoding unit) which receives a client signal from a transmission path on a client side, error-correction-encodes the client signal, and then transmits the resulting signal to a super line side as a super FEC signal. (Page 1, ¶ 1, page 3, ¶ 48). Ohira also teaches decoding side which receives and decodes a super forward error correction (FEC) (encoded signal) signal and then transmits the decoded signal to a communication path on the client side as a client signal. Ohira suggests an "output unit" by outputting the restored client signal that is converted into an optical signal to the transmission path on the client side. Ohira further for calculations intended to find an error locator polynomial (hereinafter abbreviated as "ELP") indicative of an error position and each polynomial coefficient of

an error evaluator polynomial (hereinafter abbreviated as "EVP") indirectly indicative of an error value from the result of the syndrome calculation, a method using Euclidean mutual division (Yule-Walker equation) is widely known. Ohira even further teaches the error position calculation is performed by substituting an element of Galois field corresponding to a symbol position for an RS code and to a bit position for a BCH code into an error locator polynomial (ELP) to determine whether or not an error exists at the symbol position or the bit position by examining whether or not the substitution results in "zero". Likewise, for the error value calculation, an element of Galois field corresponding to a symbol position or a bit position is substituted into an error evaluator polynomial (EVP) or an ELP differential polynomial, and if an error is found at the symbol position or the bit position, the error value is calculated (determining the number of errors to be the maximum matrix size that corresponds to said obtained solution that is not zero, and determining whether said number of errors equals the maximum number of correctable errors). (Page 17, ¶ 278). Ohira does not explicitly teach establishing a Yule-Walker equation or obtaining the solution thereof, however, Ohira does disclose while describing the decoding side that the primitive element of Galois field (2^n), which is the basis for the Reed-Solomon code and BCH code, and a method of using Euclidean mutual division (Yule-Walker equation). (Page 7, ¶ 109, page 17, ¶ 278). Zhang teaches, in an analogous art disclosing methods of speeding up the solution of Yule-Walker equations, the key equation for decoding BCH and Reed-Solomon code and the equation involved in the identification of the coefficients of an autoregressive model, are Yule-Walker equations. Zhang also teaches the Levinson algorithm, Berlekamp-Massey

algorithm and Euclidean algorithm are the three well-known fast algorithms for this purpose. It would have been obvious to one of ordinary skill in the art at the time the invention was made that Ohira does suggest establishing a Yule-Walker equation or obtaining the solution thereof. The artisan would have been motivated to do so because Ohira utilizes the Euclidean algorithm disclosed by Zhang (Page 2987, col. 1, page 2991, col. 2). Ohira does not explicitly teach "employing Jacobi's formula to result in the calculation of the determinants of the symmetric matrices. However, Koga teaches, in an analogous art pertaining to an error correction code decoding system using BCH (Bose-Chaudhuri-Hocquenghem) code for correcting error bits, a Q determinant or a Q polynomial that gives the value of a coefficient of an error locator polynomial is calculated one by one, using those already calculated, and the A determinants or Q polynomials thus obtained determine the number of error bits, and all the coefficients of the error locator polynomial. (Col. 2, lines 4-11). Koga also teaches since a Q determinant is a symmetrical determinant, any element of which is a syndrome belonging to GF (2^m), and since a diagonal element of it denoted by S_{2i} can be expressed as $S_{2i} = S_i^2$, it is always given as the square of a polynomial of syndromes. (Col. 4, lines 52-56). Koga further teaches the invention provides error correction equipment with simple circuitry that can decode any received code word (applied to Reed-Solomon codes having an arbitrary minimum distance) with reduced quantity of calculation. (Col. 14, ll. 15-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made that Koga's symmetrical determinant calculation would be implemented using Jacobi's formula. The artisan would have been motivated

to do so because the Jacobi's formula is a method well known in the art for the calculation of the determinants of the symmetric matrices. It also, would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ohira's decoder to incorporate the symmetrical determinant calculation ability of Koga. The artisan would have been motivated to do so because this would enable Ohira's decoder to perform the calculation of the determinants of the symmetric matrices of Koga for proper error location and determining the number of error bits.

<u>Claim 5:</u>

Ohira discloses an invention which relates to a method for encoding/decoding an error correcting code, a transmitting apparatus and a network which are suitable for use in optical communication networks. Ohira teaches an encoding side (encoding unit) which receives a client signal from a transmission path on a client side, error-correction-encodes the client signal, and then transmits the resulting signal to a super line side as a super FEC signal. (Page 1, ¶ 1, page 3, ¶ 48). Ohira also teaches decoding side which receives and decodes a super forward error correction (FEC) (encoded signal) signal and then transmits the decoded signal to a communication path on the client side as a client signal. Ohira suggests an "output unit" by outputting the restored client signal that is converted into an optical signal to the transmission path on the client side. Ohira further for calculations intended to find an error locator polynomial (hereinafter abbreviated as "ELP") indicative of an error position and each polynomial coefficient of an error evaluator polynomial (hereinafter abbreviated as "EVP") indirectly indicative of an error value from the result of the syndrome calculation, <u>a method using Euclidean</u>

mutual division (Yule-Walker equation) is widely known. Ohira even further teaches the error position calculation is performed by substituting an element of Galois field corresponding to a symbol position for an RS code and to a bit position for a BCH code into an error locator polynomial (ELP) to determine whether or not an error exists at the symbol position or the bit position by examining whether or not the substitution results in "zero". Likewise, for the error value calculation, an element of Galois field corresponding to a symbol position or a bit position is substituted into an error evaluator polynomial (EVP) or an ELP differential polynomial, and if an error is found at the symbol position or the bit position, the error value is calculated (determining the number of errors to be the maximum matrix size that corresponds to said obtained solution that is not zero, and determining whether said number of errors equals the maximum number of correctable errors). (Page 17, ¶ 278). Ohira does not explicitly teach establishing a Yule-Walker equation or obtaining the solution thereof, however, Ohira does disclose while describing the decoding side that the primitive element of Galois field (2^n), which is the basis for the Reed-Solomon code and BCH code, and a method of using Euclidean mutual division (Yule-Walker equation). (Page 7, ¶ 109, page 17, ¶ 278). Zhang teaches, in an analogous art disclosing methods of speeding up the solution of Yule-Walker equations, the key equation for decoding BCH and Reed-Solomon code and the equation involved in the identification of the coefficients of an autoregressive model, are Yule-Walker equations. Zhang also teaches the Levinson algorithm, Berlekamp-Massey algorithm and Euclidean algorithm are the three well-known fast algorithms for this purpose. It would have been obvious to one of ordinary skill in the art at the time the

invention was made that Ohira does suggest establishing a Yule-Walker equation or obtaining the solution thereof. The artisan would have been motivated to do so because Ohira utilizes the Euclidean algorithm disclosed by Zhang (Page 2987, col. 1, page 2991, col. 2). Ohira does not explicitly teach "employing Jacobi's formula to result in the calculation of the determinants of the symmetric matrices. However, Koga teaches, in an analogous art pertaining to an error correction code decoding system using BCH (Bose-Chaudhuri-Hocquenghem) code for correcting error bits, a Q determinant or a Q polynomial that gives the value of a coefficient of an error locator polynomial is calculated one by one, using those already calculated, and the A determinants or Q polynomials thus obtained determine the number of error bits, and all the coefficients of the error locator polynomial. (Col. 2, lines 4-11). Koga also teaches since a Q determinant is a symmetrical determinant, any element of which is a syndrome belonging to GF (2^m), and since a diagonal element of it denoted by S_{2i} can be expressed as $S_{2i} = S_i^2$, it is always given as the square of a polynomial of syndromes. (Col. 4, lines 52-56). Koga further teaches the invention provides error correction equipment with simple circuitry that can decode any received code word (applied to Reed-Solomon codes having an arbitrary minimum distance) with reduced quantity of calculation. (Col. 14, ll. 15-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made that Koga's symmetrical determinant calculation would be implemented using Jacobi's formula. The artisan would have been motivated to do so because the Jacobi's formula is a method well known in the art for the calculation of the determinants of the symmetric matrices. It also, would have been

obvious to one of ordinary skill in the art at the time the invention was made to modify Ohira's decoder to incorporate the symmetrical determinant calculation ability of Koga. The artisan would have been motivated to do so because this would enable Ohira's decoder to perform the calculation of the determinants of the symmetric matrices of Koga for proper error location and determining the number of error bits.

Ohira, in view of Zhang and further in view of Koga is silent on conditional branching. It would, therefore, be obvious to one skilled in the art at the time the invention was made that conditional branching or no conditional branching would be an option to one skilled in the art. The artisan would be motivated to do so because, as disclosed above, Zhang teaches, in an analogous art disclosing methods of speeding up the solution of Yule-Walker equations, the key equation for decoding BCH and Reed-Solomon code and the equation involved in the identification of the coefficients of an autoregressive model, are Yule-Walker equations. Zhang also teaches the Levinson algorithm, Berlekamp-Massey algorithm and Euclidean algorithm are the three well-known fast algorithms for this purpose. As a teaching reference, the Examiner refers the Applicants to Berlekamp (US-4162480) col. 27, ll. 43-57, where Berlekamp suggests the use of unconditional branches (without conditional branching) as well as conditional branches. Also, in col. 69, ll. 45-56 Berlekamp suggests decoders are generated without any branching overhead costs.

Claims 2, 6, 10 and 14:

Ohira teaches, while describing the encoding/decoding side, that the primitive element of Galois field (2^n), which is the basis for the Reed-Solomon code and BCH code. (Page 4, ¶ 64, Page 7, ¶ 109).

Claims 3, 7, 11 and 15:

"said received digital signals are transmitted using wavelength division multiplexing."

Ohira teaches it is possible to readily encode an error correcting code which is suitable for maintaining a transmission distance when the degree of multiplexing is increased in the time division multiplexing, maximizing the transmission distance for a mixture of optical signals at different bit rates in the wavelength division multiplexing, and increasing a regenerator interval on condition that the degree of multiplexing is not changed in the time division multiplexing. (Page 7, ¶ 112).

Claims 4, 8, 12 and 16:

"used for at least one of the decoding of digital signals and error correction."

Ohira teaches when code subblocks 10-i for the C1–encoding comprise 16 subblocks each having a length of 255 bytes corresponding to each of 16 rows, either of the following two can be employed as the C1 code: an eight-error-correcting RS code (255, 239); and an eleven-error-correcting shortened BCH code (2040, 1919) based on Galois field (2048). (Page 7, ¶ 116, Page 8, ¶ 117,118).

Claims 17-20:

The motivation to combine Ohira in view of Koga is outlined as per claims 1, 5, 9 and 13 above. Koga teaches "obtaining the solution of said Yule-Walker (YM) equation is limited to addition and multiplication operations" as illustrates in Table III, page 2997, the multiplications required for solving the YM equation with the various algorithms.

Claims 21-23:

Ohira, in view of Zhang and further in view of Koga is silent on conditional branching. It would, therefore, be obvious to one skilled in the art at the time the invention was made that conditional branching or no conditional branching would be an option to one skilled in the art. The artisan would be motivated to do so because, as disclosed above, Zhang teaches, in an analogous art disclosing methods of speeding up the solution of Yule-Walker equations, the key equation for decoding BCH and Reed-Solomon code and the equation involved in the identification of the coefficients of an autoregressive model, are Yule-Walker equations. Zhang also teaches the Levinson algorithm, Berlekamp-Massey algorithm and Euclidean algorithm are the three well-known fast algorithms for this purpose. As a teaching reference, the Examiner refers the Applicants to analogous art Berlekamp (US-4162480) col. 27, ll. 43-57, where Berlekamp suggests the use of unconditional branches (without conditional branching) as well as conditional branches. Also, in col. 69, ll. 45-56 Berlekamp suggests decoders are generated without any branching overhead costs.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John J. Tabone, Jr. whose telephone number is (571) 272-3827. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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